

Stop Sign Vandalism

An exploration of the influence of demographics and municipal variability

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Abstract: Stop signs are conspicuous features of the urban landscape whose appearance can be radically altered through deliberate defacing. An understanding of acts of vandalism as discrete, intentional events presenting aspects of human behaviour incites the investigation of demographic factors likely to influence the prevalence of vandalism in a given area. While no strong correlations between census data and the average degree of vandalism in a given census tract were found, slight variations between municipalities were discovered and the significance discussed. Possible reasons for the lack of statistically significant correlations are also explored, with particular attention to the potential conflation of intentional abuse with the categories of damage and wear, used here as a proxy for the age of a stop sign.

Introduction

Intentionally vandalised public property is a ubiquitous sight in urban centres, and the stop signs of Montreal afford no exception. A stop sign is a red octagonal manmade feature erected by a municipality to regulate the flow of traffic and ensure public safety. Far from uniform, however, stop signs exhibit variations in language, text font, and mounting, to name but a few of the physical attributes of stop signs determined during the stages of manufacture and placement. The physical state of a stop sign does not remain constant over time, however, but is subject to change through the effects of weathering, impact, and deliberate abuse. This report will focus on the intentional acts of vandalism that serve to change the visual face or back of a stop sign as a characteristic of human behaviour inscribed on material culture. Through the examination of the incidence of vandalism on stop signs in relation to a neighbourhood's demographic composition, statistical analysis will seek to comment on the identity of the perpetrators of these crimes, or identify areas where vandalism is more likely to occur as a function of various demographic factors. An assessment of the usefulness of both the municipality and the census tract as spatial units will be necessary to ensure proper interpretation of the findings.

Methods

The Stop: Toutes Directions project is based on the recorded observations of 2816 stop signs located at the intersections of 7 boroughs or municipalities of the island of Montreal. For each stop sign, the presence of vandalism was classified on a scale from 0 to 3 reflecting a balance between number of discrete acts of vandalism as well as the prominence of any given instance of vandalism, an exercise carried separately out for the front and the back. Vandalism includes all written graffiti, stickers, or otherwise clearly intentional defacing of the stop sign. For the purpose of this study, the separate categories for the two faces of the stop sign will be grouped into an index of total vandalism, ranging from 0 to 6. Given the much higher visibility of vandalism on the front of a stop sign, it could be argued that this amalgamation of data erases a key distinction, or that the two faces should be accorded unequal weight. However, this paper does not seek to distinguish between different types of vandalism, which would involve a psychological evaluation of the motivation behind of the crime. The use of a single

category is unlikely to influence the study of demographic features, and is moreover statistically manageable.

In a similar fashion, the degrees of wear and damage were ascertained on a scale from 0 to 3 for each sign. These variables, once more amalgamated into one category, capture gradual processes physically altering the stop sign, such as fading through extensive exposure to sunlight, as well as the cumulative effects of discrete events, such as dents caused by impact. As a measure of the deterioration of the sign, the sum of damage and wear will serve as a proxy for the age of the stop sign. While the connection between the damage and wear borne by a sign and its age may be a tenuous one, without access to municipal records it is the closest approximation available. For lack of a better synonym, the designation Decay will hereafter be used to refer to the sum of damage and wear. The physical changes wrought upon a stop sign in its environment thus result from the combined effects of vandalism and decay, distinguishable primarily through the intentionality of the former.

Finally, recording the precise location of each stop sign is essential to conducting an analysis of spatial patterning. The urban geography of Montreal can be divided into a variety of meaningful units, two of which pertain to a demographic study of stop sign vandalism. The regulation, upkeep, and replacement of stop signs are managed by the public works departments of independent municipalities or boroughs of Montreal. The boundaries between these communities are commonly known to residents and serve to demarcate loosely-defined cultural regions, whether real or perceived. The data necessary to study the demographic composition of an area, however, is collected by Statistics Canada at the level of the census tract, an artificial subdivision of a municipality or borough. With the notable exception of Hampstead, comprising a single census tract, these spatial units are much smaller than municipalities, which can cover extensive areas of Montreal traversing great cultural diversity. By comparison, a census tract is much more localised, limiting the extent to which this internal heterogeneity can skew any statistics generated. As census tracts are artificially superimposed onto a map of Montreal, contiguous streets may be classed separately despite virtual identicalness, an arbitrary division necessary for any exercise contingent on quantification.

Results

Before any serious statistical inspection can take place, the data collected for all 2816 stop signs must be converted into a set of useful values. Grouping the values for vandalism by census tract allows for the study of trends potentially influenced by a number of demographic factors (Appendix A). A raw sum of the total vandalism of all signs within a census tract is useless for the purpose of comparison, however, given the great degree of variability in the size of census tracts. Dividing this value by the number of stop signs present in each census tract yields the average degree of vandalism for a stop sign in a given census tract. Calculation of the mean is preferred over the median as it reflects extreme values, representing heavily vandalised signs in this instance, which are central to a proper scrutiny of vandalism.

There are infinite possible explanations for the higher incidences of stop sign vandalism in certain regions, and this study purports to identify factors that influence vandalism rates in a community. The 2006 census conducted by Statistic Canada covers a broad array of characteristics, narrowed here to select variables hypothesised to bear some impact on the vandalism of stop signs within the census tract. The following analysis is not intended to cover all angles affecting the selected data, as each variable is influenced by a number of complex factors. This discussion will focus on the reasons a particular aspect of demographics was initially deemed relevant to a study of stop sign vandalism.

Certain assumptions are frequently made by the general public about the segment of the population responsible for vandalism, attributing graffiti primarily to male youth. A study of the age composition of a neighbourhood might lend support to this proposition.

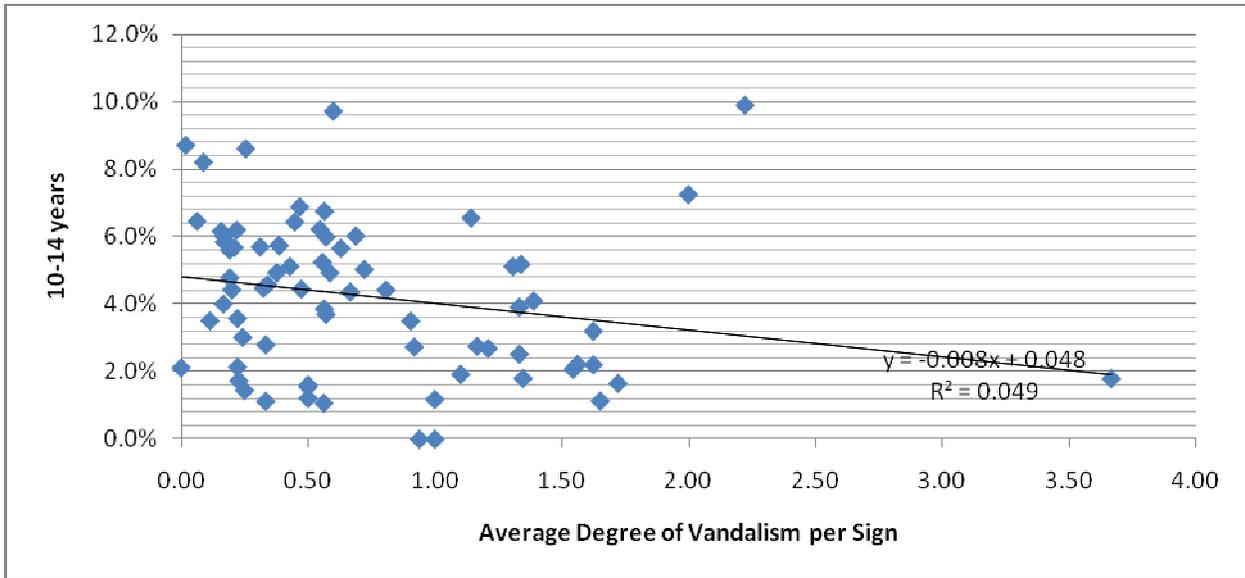


Figure 1: The relation between the prevalence of vandalism by census tract and the proportion of the total population between 10 and 14 years of age

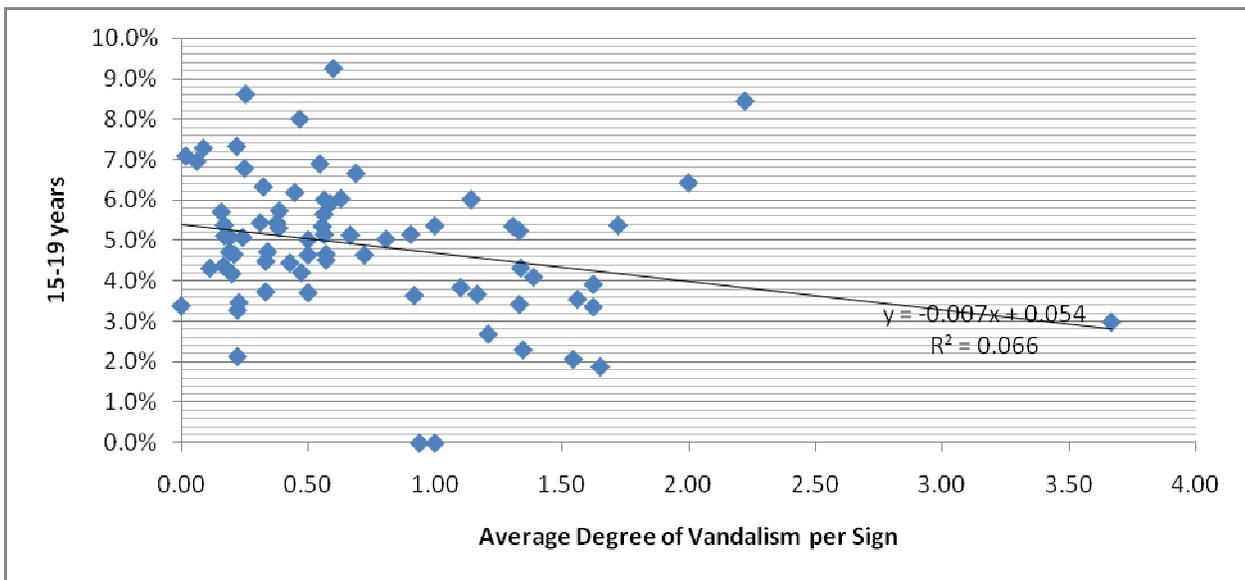


Figure 2: The relation between the prevalence of vandalism by census tract and the proportion of the total population between 15 and 19 years of age

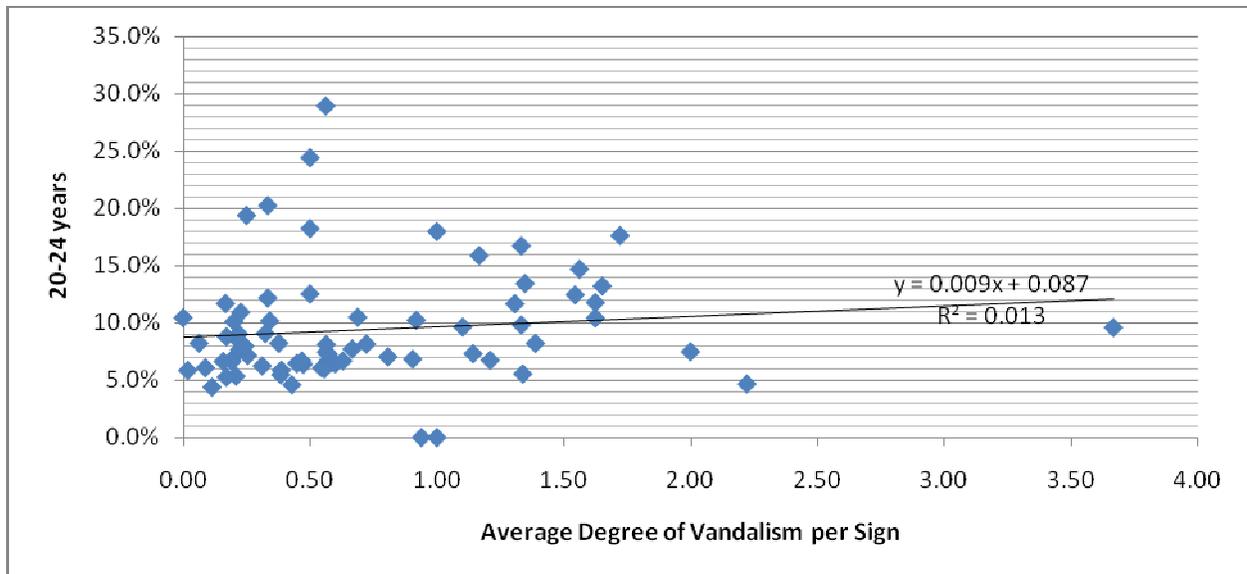


Figure 3: The relation between the prevalence of vandalism by census tract and the proportion of the total population between 20 and 24 years of age

Census tracts demonstrate a very wide range of variability in the youthful proportion of the population, separated here into the categories 10-14 years old, 15-19 years old, and 20-24 years old as drawn from the 2006 census data. However, the representation of youth does not yield a strong correlation with the prevalence of vandalism in an area. In fact, where some tenuous association might be made for the younger two age groups, yielding R-squared values of 0.049 and 0.066 respectively, the reverse of the predicted trend is exhibited; as the percentage of the population in their pre-teen and teenage years rises, the average degree of vandalism per sign slowly diminishes.

The deliberate alteration of municipal signage is a conspicuous criminal offense that changes the urban environment. Whether ignored or regarded with distaste, the average citizen would not delight in an overwhelming presence of vandalism in the vicinity of their home. Insofar as all residents play a role in the upkeep of their surroundings, through reported complaints about vandalism or maintenance of a safe, crime-free atmosphere, demographic factors likely to contribute to a sense of community were analysed with regard to the prevalence of vandalism. A high ratio of home-owners to residents renting their living space would theoretically indicate a population more established in the area, with a vested interest in the aesthetic appeal of the community. Mobility figures likewise follow the same line of thought, as neighbourhoods with high rates of turnover might reflect this itinerant behaviour through an increase in the incidence of vandalism on stop signs. It is not expected that these factors be in a direct causal relationship with the incidence of vandalism, but rather, any correlation would indicate shared influence issuing from a third, unidentified factor.

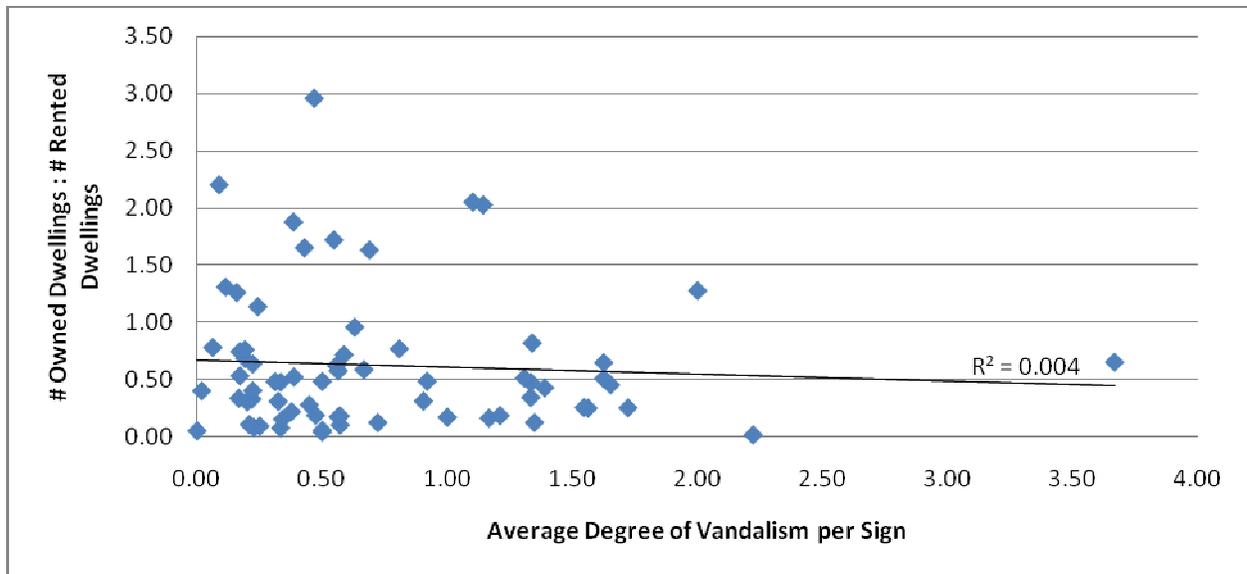


Figure 4: The relation between the prevalence of vandalism and the ratio of owned dwellings to rented dwellings by census tract

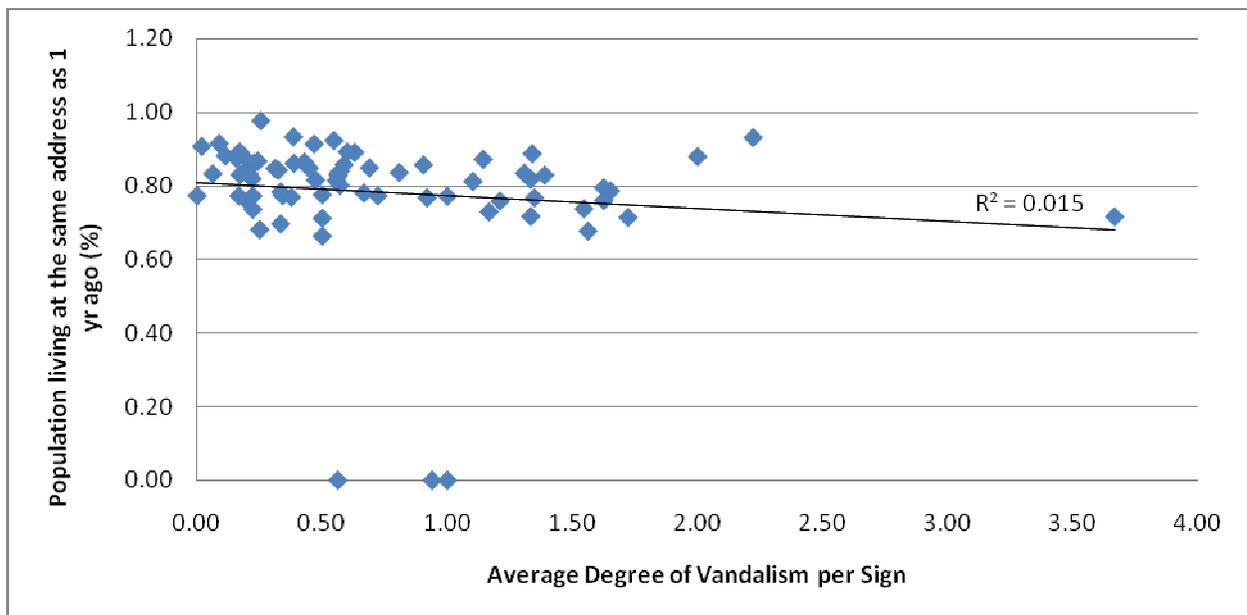


Figure 5: The relation between the prevalence of vandalism and the proportion of the total population over 1 year of age living at the same address as 1 year previous by census tract

As evident by the R-squared values approaching zero, no correlations exist between the ratio of owned to rented dwellings, or the proportion of the population that can be considered “settled,” and the prevalence of vandalism. Either the social psychological interpretation of home-owners or otherwise residentially established individuals as more community-minded is flawed, or the general population of a census tract wields no control over the vandalism or subsequent replacement of its stop signs.

Where the vandalism of stop signs is particularly prominent, the image of an area may be aesthetically injured. The 2006 census data provides information on another statistical indicator of conspicuous neglect: the percentage of dwellings in a census tract requiring major repair. While stop signs fall under the purview of municipal administration, and dwelling repair is the responsibility of

individual proprietors, their comparable contribution, or detraction, from the aesthetic appeal of a community might generate a statistical association between the two.

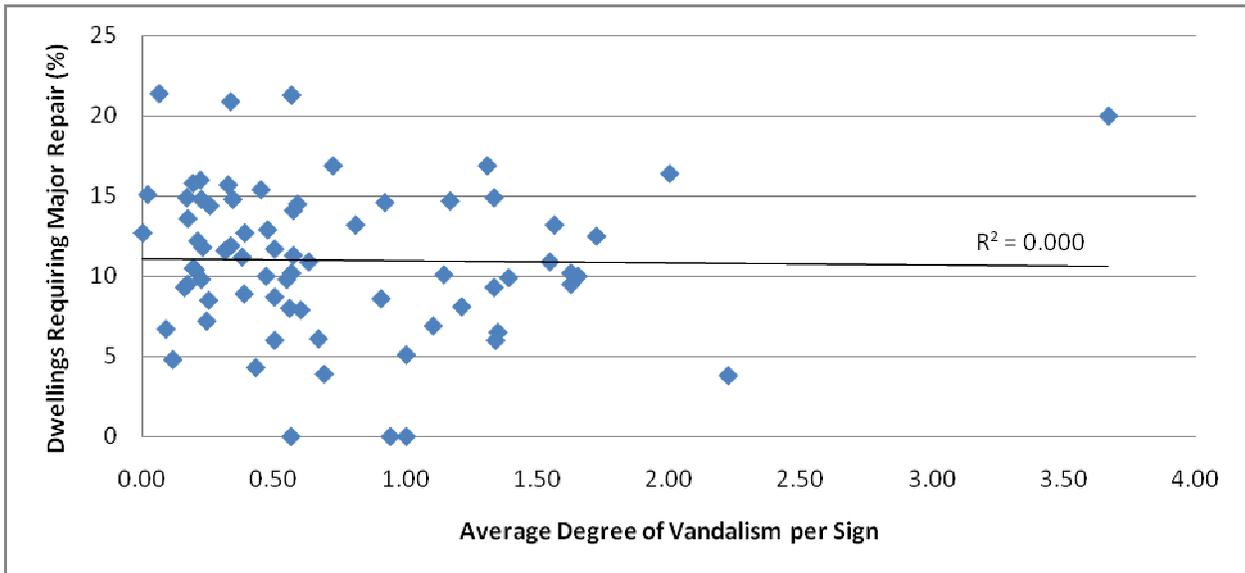


Figure 6: The relation between the prevalence of vandalism and the proportion of dwellings requiring major repair by census tract

Absolutely no correlation can be drawn between the proportion of dwellings in need of repair and the prevalence of stop sign vandalism. Further exploration of this result would entail an inquiry into the true causes or definition of “dwellings requiring major repair,” as this category likely includes a number of older buildings which may add to the charm of the community, thereby increasing rather than injuring the community’s aesthetic value.

Not a single demographic variable selected correlated in any significant way with the incidence of vandalism at the level of the census tract. Rather than invalidate all theories proposed to explain the wide variation in the prevalence of stop sign vandalism, further factors at play are worth mentioning.

The above manipulation of data is predicated on the rough correspondence of the prevalence of vandalism in a census tract to the rate at which stop signs are vandalised. However, the rate of replacement of stop signs is itself subject to a great degree of variability. The efficiency, budget, and priority scheme of the departments of public works vary by municipality, and the balance of these and other factors combine to determine the interplay between prevalence and actual rate of vandalism in the region. Once vandalised, a stop sign may be promptly replaced, or alternatively be integrated into the urban landscape for years to come. An analysis of the relation between vandalism and decay, the proxy for age, at the level of the municipality or borough may uncover any significant differences in municipal upkeep (Appendix B).

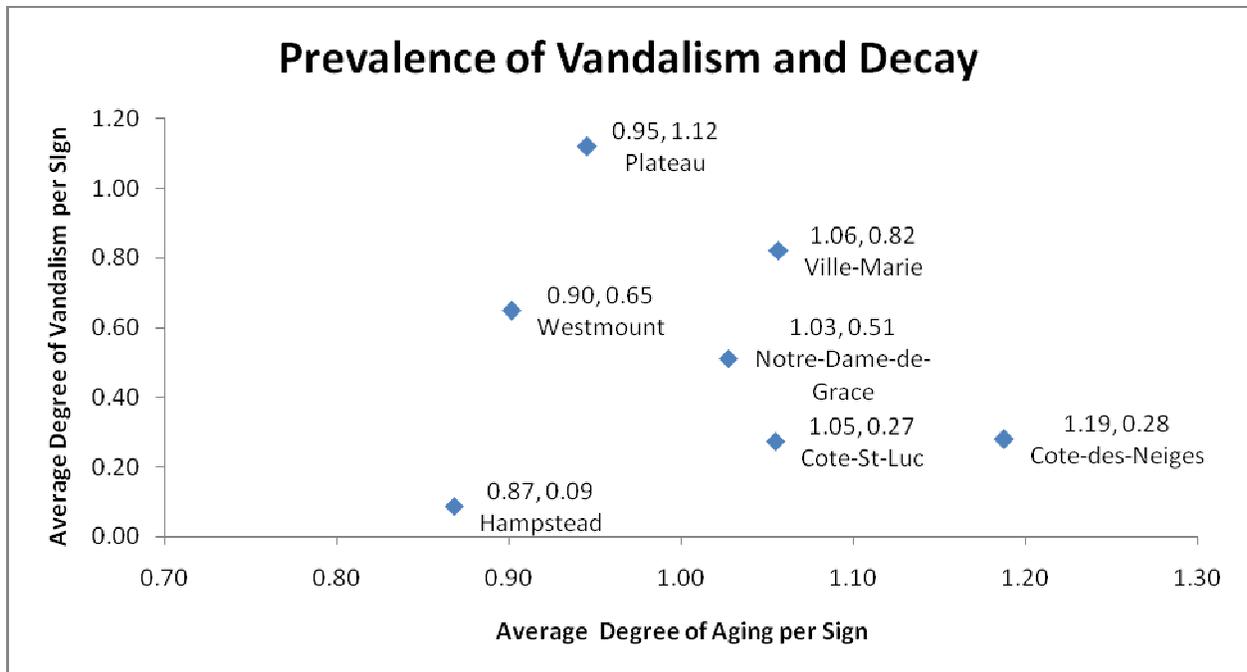


Figure 7: The relation between the prevalence of vandalism and the prevalence of decayed signs by borough or municipality

The widely scattered appearance of Figure 7 indicates stark contrasts in both the prevalence of vandalism and the effects of decay on stop signs in the seven different boroughs and municipalities, which translate to highly visible differences in the observation of vandalism. For instance, both Cote-St-Luc and Ville-Marie offer comparable values for the average degree of decay of their stop signs, yet Ville-Marie exhibits triple the incidence of vandalism. Hampstead's stop signs are overwhelmingly less vandalised than those of the rest of the survey areas of Montreal; an explanation can only be partly attributed to its low degree of decay, perhaps reflective of a swifter process of stop sign replacement. These values serve to confirm the disparity in stop sign vandalism and decay across the various municipalities and boroughs without allowing for these differences to be accounted for demographically using the statistics available.

The values presented for each municipality are misleading if taken to apply evenly to all census tracts sub-dividing these municipalities. The internal variation within each municipality or borough is also quite significant with respect to the relation between vandalism and decay.

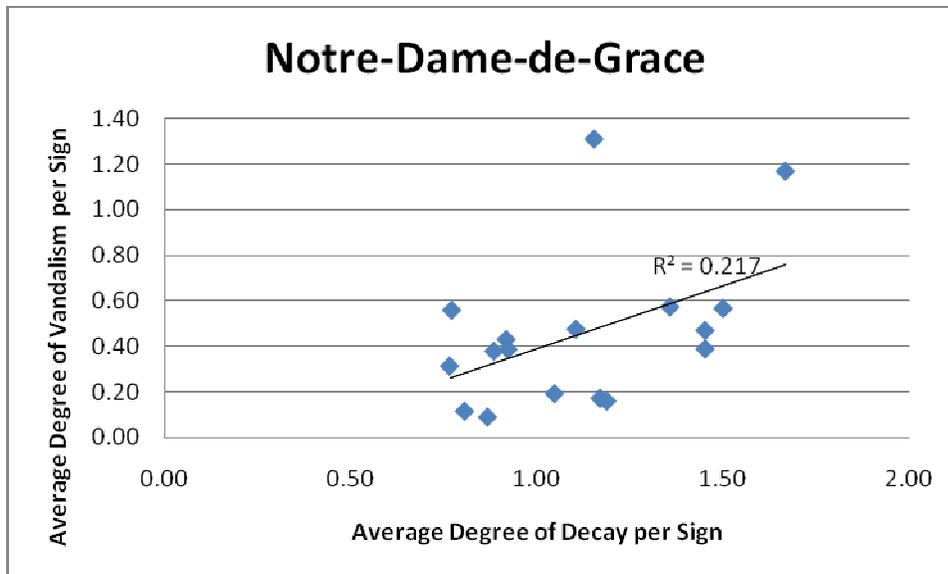


Figure 8: The relation between the prevalence of vandalism and the prevalence of decayed signs by census tract for the borough of Notre-Dame-de-Grace

While not a very strong correlation, the R-squared value of 0.217 is nevertheless statistically significant, establishing a positive correlation between the average degrees of vandalism and decay per sign in the census tracts of Notre-Dame-de-Grace. On the whole, census tracts with older stop signs, as determined by the decay variable, also harbour more vandalised stop signs, potentially signalling lax replacement efficiency on the part of the borough’s public works department.

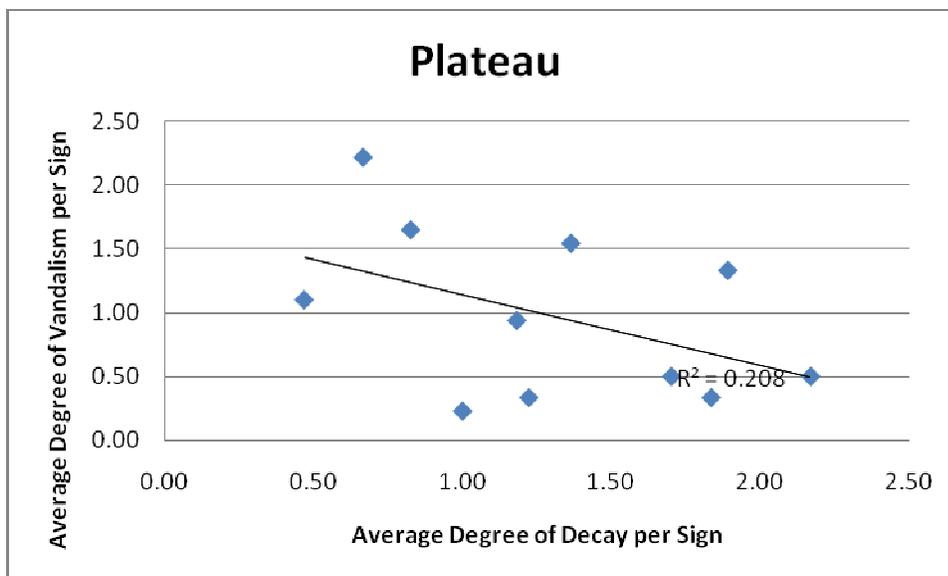


Figure 9: The relation between the prevalence of vandalism and the prevalence of decayed signs by census tract for the borough of the Plateau

Interestingly, a similar R-squared value is achieved by plotting the census tracts of the Plateau, yet this correlation is negative, denoting a higher incidence of vandalism in census tracts with relatively less aged stop signs. Referring back to Figure 7, the Plateau is the borough with the highest degree of vandalism per sign, and potential causal relations must be surmised within this context. One possible explanation is the more rapid replacement of vandalised signs in the Plateau to offset the high rates of vandalism. It

must be noted that while an R-squared value of 0.208 generally indicates some degree of statistical significance, the low number of census tracts on which this scatter plot is based may skew the statistics to generate a false level of significance.

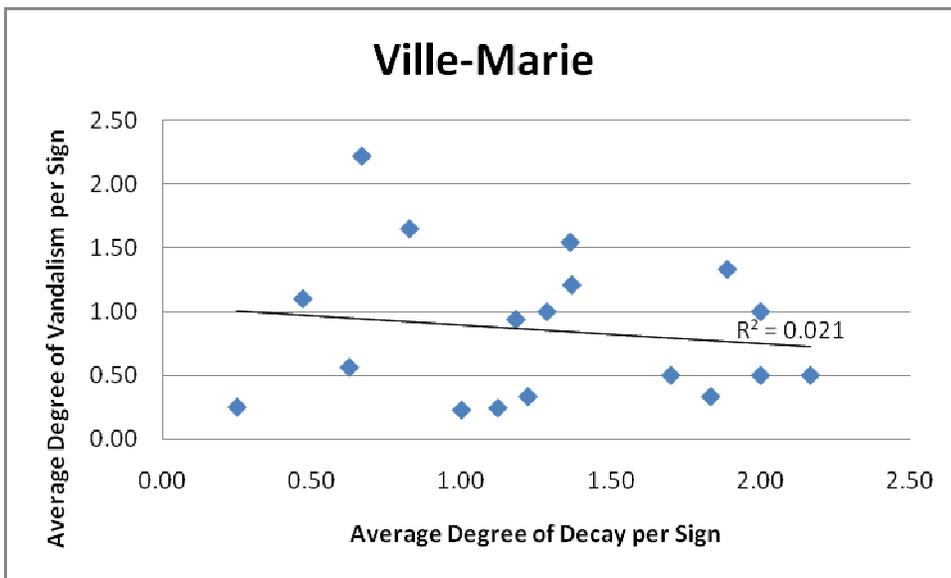


Figure 10: The relation between the prevalence of vandalism and the prevalence of decayed signs by census tract for the borough of Ville-Marie

To offer a third possible graphic representation of the correlation between the incidence of vandalism and decay, the census tracts of Ville-Marie yield the insignificant R-squared value of 0.021. Thus no meaningful generalisation can be proposed to comment on the municipal upkeep of all Ville-Marie census tracts by the borough's management.

A scatter-plot charting the average degrees of vandalism and decay per sign for all census tracts covered in the survey area yields the even lower R-squared value 0.008. This lack of correlation does not necessarily indicate complete independence of the two variables, but at the very least they inter-relate in a manner that differs across census tracts.

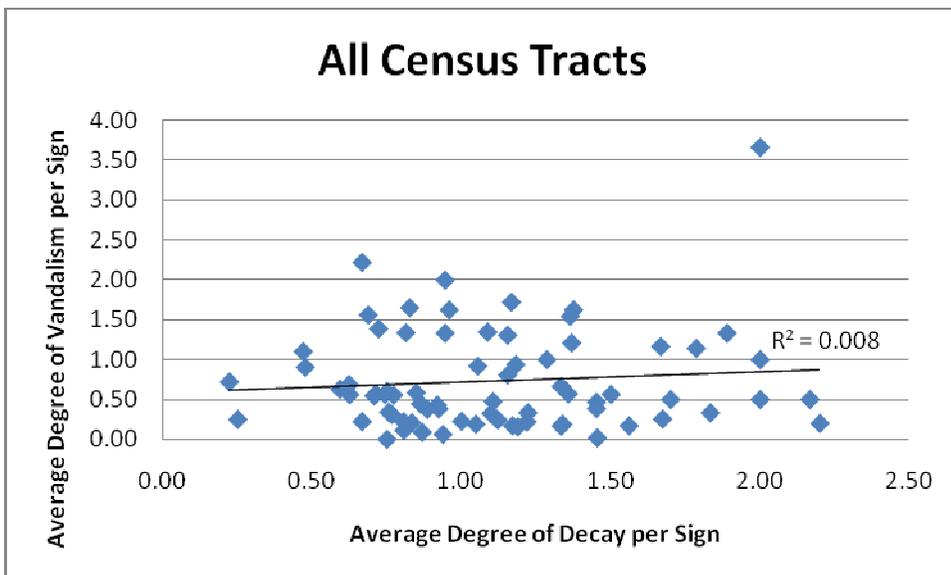
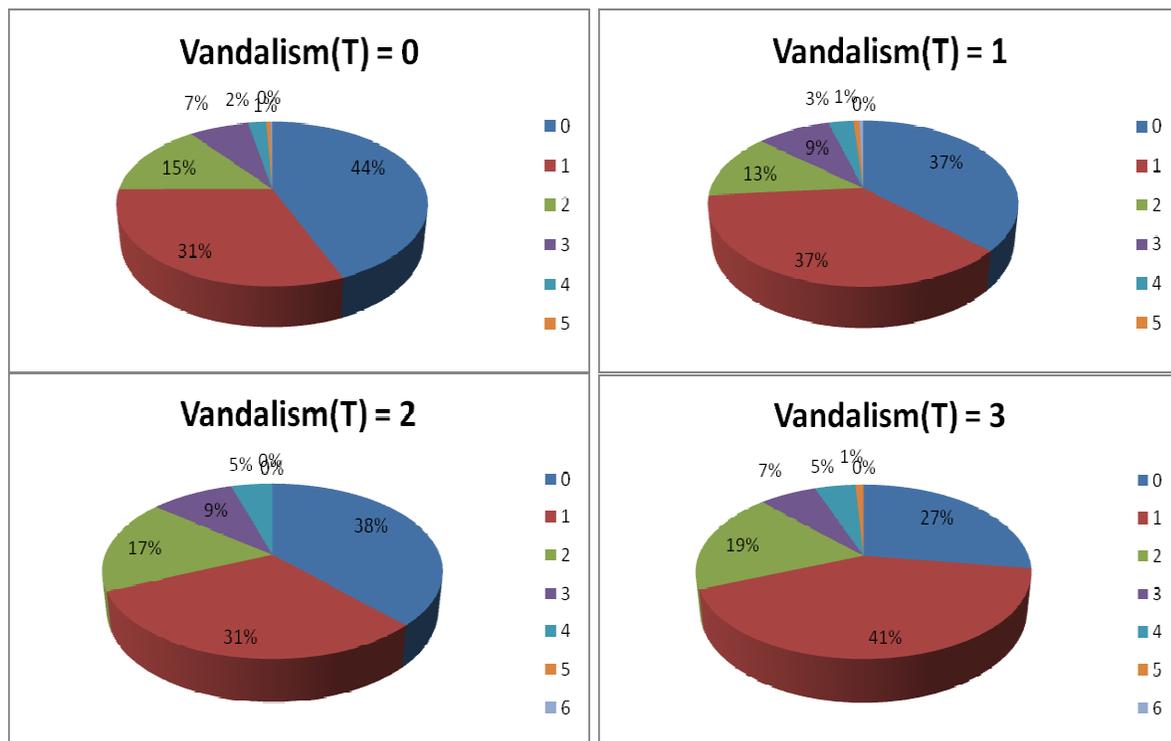


Figure 11: The relation between the prevalence of vandalism and the prevalence of decayed signs by census tract for the entire survey area of Montreal

One last facet of the data must be analysed to account for the near-universal lack of significant correlations generated by relating vandalism to decay. It is possible that the categories used themselves are inherently flawed and thus prevent proper interpretation. For any given stop sign, the degree of vandalism and the degree of decay have been treated as independent variables lending themselves to cross-comparison. However, the similarities between the physical abuse wrought by intentional vandalism or the physical changes caused by damage and wear, both assumed to be roughly a function of age, may result in a degree of overlap between the two categories, further compounded by the element of qualitative assessment often involved on the part of the surveyor. Intentional defacing of a stop sign is confined to the designation "vandalism," in theory; in the field, however, the categories of wear, damage, and vandalism are far from clear-cut. It is often virtually impossible to distinguish intentional abuse that is neither graphic nor textual, as throwing rocks at a sign, from dents not issuing from human agency. Furthermore, the attempt to restore a stop sign as an alternative to replacement will often be recorded as wear, as the graffiti itself will disappear from view, only to be replaced by an irregular fading of the surface of the stop sign. Thus field experience reveals a blurred boundary line between the vandalism and decay variables frequently treated as comparable, discrete categories for the purpose of this study.



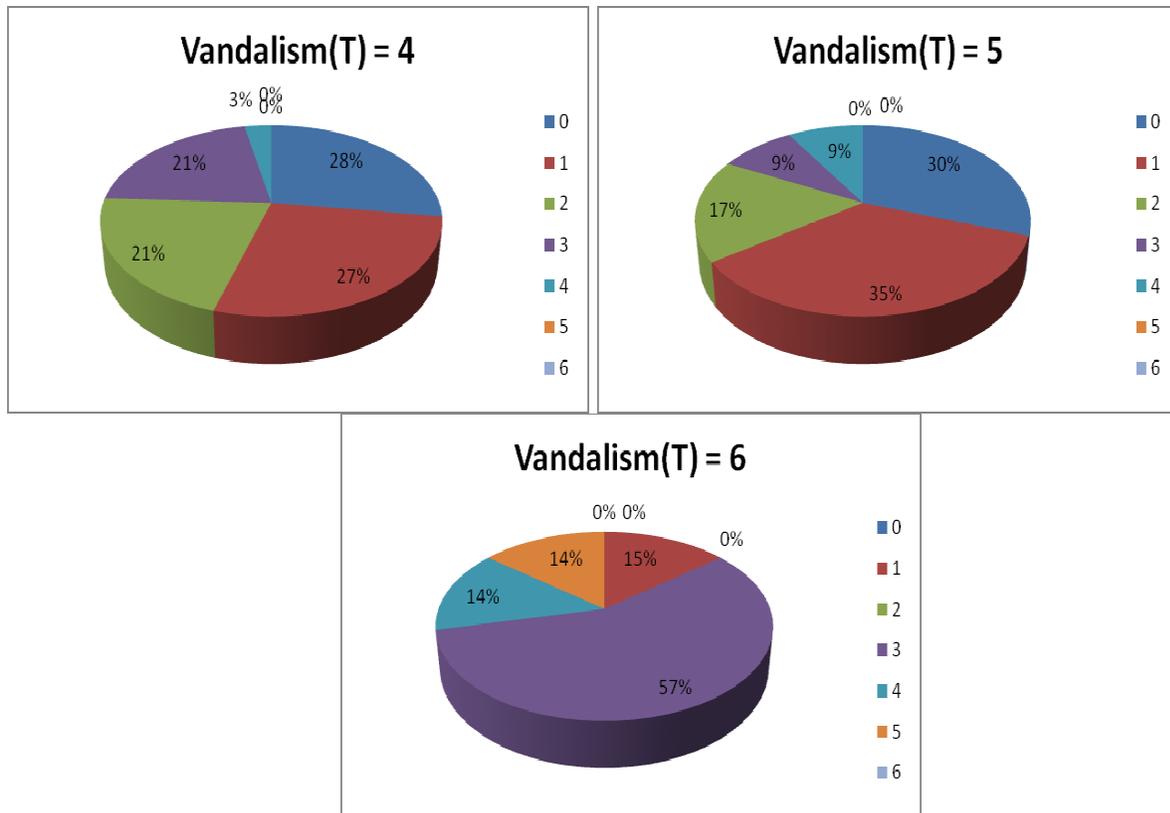


Figure 12: The proportions of stop signs assigned to each degree of decay, analysed for all 7 possible classifications of total vandalism in turn

Pie charts generated for every possible degree of vandalism contain the relative frequencies of degrees of decay in each instance. The trends exhibited are readily ascertained by a visual comparison of the charts to one another. As the degree of vandalism on a given stop sign climbs, so too do the relative frequencies of the higher decay levels. This relation could be due to the conflation of the categories of decay and vandalism, which leads surveyors to attribute some damage or wear to otherwise vandalised stop signs where in fact all physical change in the stop sign resulted from intentional abuse. However, this conclusion is premature, as the same trend could be caused by a true correlation between decay and vandalism, indicating that the older the stop sign, the more likely it is to exhibit vandalism. Lastly, each of the above pie charts is based on samples of varying sizes, with the sample size diminishing consistently as the degree of total vandalism rises. In consequence, the degree of accuracy of the pie charts steadily decreases. The subset of stop signs with the highest degree of vandalism, 6, is based on the sorely inadequate sample size of seven stop signs and therefore included more for the purpose of completeness than for representative value.

Discussion

For every single demographic variable selected, no influence on the prevalence of vandalism within a census tract was statistically apparent. Nevertheless, the vast differences the incidence of vandalism across the broad survey area of central Montreal must have some basis. The general premise of the theories postulated above, namely, that vandalism is correlated to demographic features of the residents living in close proximity to vandalised stop signs, is likely at fault. The act of vandalism is directly associated with one individual, the perpetrator. Even if he or she is indeed resident in the same census tract as the stop sign in question, the identity of one person is only weakly predictable by statistical

means, and the introduction of intentionality into the equation essentially renders a foray into the age demographics of a census tract a futile exercise if geared toward confirming a perpetrator's identity.

As populations are not confined to their place of residence, any direct association assumed between people and place is a false construct. Human beings are mobile and usually occupy multiple spheres of socialisation simultaneously, spread out across indeterminate distances, thereby bringing individuals into regular contact with stop signs beyond the borders of their census tract and municipality or borough. The motivational factors underlying vandalism must thus be brought under scrutiny. Would the perpetrator be more likely to vandalise his or her own neighbourhood's stop signs, those in a more highly-travelled commercial area, or those nearby his or her school, church, or other frequently visited location? A lack of such statistical information aside, the contemplation of this question requires a psychological analysis of the act of vandalism, which can only be touched on briefly here. Vandalism may be premeditated or spontaneous, and fulfil any number of purposes, including the assertion of identity through tagging, advertising primarily through the medium of stickers, or the pure joy of destroying public property. Any of these motives can affect the location of the vandalised stop sign in numerous and unpredictable ways.

The incidence of vandalism on stop signs has been used to implicitly comment on vandalism in specific areas more generally. In this sense, the stop sign itself cedes importance to the crimes inscribed on it. Vandalism on stop signs can be quantified with relative facility, and the existence of numerous stop signs in any given census tract or municipality allows for statistical analysis. While vandalism is not generally confined to specific media in a manner that differs spatially, the subject of generalisation must always be approached with caution. Some forms of vandalism may be aimed exclusively at defacing stop signs; the language used on a stop sign could well provide a battleground for nationalists and English Montrealers to proclaim their views on the sensitive issue of language laws. Conversely, the occurrence of high levels of more ostentatious vandalism, such as the multitude of graffiti murals observed in zone 20, is unlikely to be captured using stop sign vandalism as an indicator.

Amidst the enormous amount of data collected on 2816 stop signs, augmented by the 2006 census data covering 74 census tracts, the overuse of statistical analysis threatens to disregard the unique circumstance producing each instance of vandalism as a discrete, intentional event. In archaeology, material culture is examined to proffer insight into the behaviour of human beings. By applying the methods and principles of archaeological survey and research to an examination of stop sign vandalism, vast amounts of data can be generated and processed in an attempt to draw meaningful conclusions about the varying incidences of vandalism in disparate demographic and municipal contexts. However, certain parameters, such as human mobility and motivated intent, are not easily evaluated statistically. These qualitative aspects of vandalism obscure any possible relations between the prevalence of vandalism and the demographic composition of an area. Nevertheless, the establishment of a lack of correlation adds to a fuller understanding of stop sign vandalism as an intriguing facet of modern urban behaviour.

References

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